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EXAMINER	
CHEN, ERIC BRICE	
ART UNIT	**PAPER NUMBER**
1765	

DATE MAILED: 02/22/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

6

Office Action Summary	Application No.	Applicant(s)	
	10/721,448	BRASK ET AL.	
	Examiner	**Art Unit**	
	Eric B. Chen	1765	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *06 February 2006*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-22* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-22* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *24 November 2003* is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Drawings

1. Figures 1A-1E should be designated by a legend such as --Prior Art-- because only that which is old is illustrated. See MPEP § 608.02(g). Corrected drawings in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. The replacement sheet(s) should be labeled "Replacement Sheet" in the page header (as per 37 CFR 1.84(c)) so as not to obstruct any portion of the drawing figures. If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

3. Claims 1 and 20 stand rejected under 35 U.S.C. 102(b) as being anticipated by Lee et al. (U.S. Patent No. 6,850,683).

4. As to claim 1, Lee discloses a method, comprising: etching a waveguide (108) (column 2, lines 58-62; Figure 2) isotropically to smooth a surface (110) (column 2, lines 61-62) of the waveguide (column 4, lines 4-19; Figure 4).

5. As to claim 20, Lee discloses a method, comprising: maximizing retention of an intensity of a light signal within a waveguide (column 3, lines 45-48) by etching a waveguide isotropically to smooth a surface of the waveguide (column 4, lines 4-19).

Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

7. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

8. Claims 4-5 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Lee, in view of Wolf et al., *Silicon Processing for the VLSI Era*, Vol. 1, Lattice Press (1986).

9. As to claim 4, Lee discloses etching the waveguide before etching the waveguide isotropically (column 2, lines 58-61; Figure 2). Lee does not expressly disclose that the

first etching step is anisotropic. However, Wolf teaches that anisotropic etching results is greater dimensional control of etched features (page 551). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to use an anisotropic etching step. One who is skilled in the art would be motivated to achieve greater dimensional control over etched features.

10. As to claim 5, Lee does not expressly disclose that etching the waveguide comprises submerging the waveguide in a wet etch solution. However, Wolf teaches that wet etching is typically performed by dissolution of the material to be etching in a liquid solvent (or submerging the sample in a wet etch solution) (pages 529-530). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to submerge the waveguide in a wet etch solution. One who is skilled in the art would be motivated to wet etch according to conventional methods that are well known.

Claim Rejections - 35 USC § 103

11. Claims 3 and 22 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Lee, in view of Ishida et al. (U.S. Patent No. 4,695,122).

12. As to claims 3 and 22, Lee discloses that the waveguide comprises silicon (column 2, lines 54-55). Lee does not expressly disclose that the waveguide comprises amorphous silicon. Ishida teaches forming the waveguide of amorphous silicon and by changing sputtering conditions and sputtering gases, the refractive index of the silicon can be readily adjusted (column 2, lines 29-40). Therefore, it would have been obvious

to one of ordinary skill in the art at the time the invention was made to form a waveguide comprising of amorphous silicon. One who is skilled in the art would be motivated to use a material in which the refractive index of the silicon can be readily adjusted.

Claim Rejections - 35 USC § 103

13. Claims 6, 9, and 10 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Lee, in view of Hembree et al. (U.S. Patent No. 6,224,713).

14. As to claim 6, Lee does not expressly disclose applying sonic energy to the wet etch solution while etching the waveguide isotropically. Hembree teaches that applying sonic waves during wet etching enhances uniformity of concentration and dislodges bubbles from the etched surface, resulting in an improved etch uniformity (column 2, lines 47-59). Moreover, the presence of bubbles shields the surface from the etchant, slowing the etching rate and resulting in a rough surface (column 2, lines 29-39). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to apply sonic energy to the wet etch solution while etching the waveguide isotropically. One who is skilled in the art would be motivated to obtain a uniformly etched surface.

15. As to claim 9, Hembree discloses that the sonic energy is ultrasonic (column 2, lines 47-59).

16. As to claim 10, Hembree discloses that the ultrasonic energy is in the approximate range of 1 kHz-50 kHz (column 4, lines 64-67; column 5, lines 1-3).

Claim Rejections - 35 USC § 103

17. Claim 7 stands rejected under 35 U.S.C. 103(a) as being unpatentable over Lee, in view of Hembree, in further view of Li (U.S. Patent No. 5,976,767).

18. As to claim 7, Lee does not expressly disclose that the sonic energy is megasonic. However, Li teaches that the application of megasonics during wet etching combines chemical and physical forces, increasing the material removal rate of the etch (column 6, lines 12-18). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to use sonic energy that is megasonic. One who is skilled in the art would be motivated to increase the material removal rate of the etch.

Claim Rejections - 35 USC § 103

19. Claim 8 stands rejected under 35 U.S.C. 103(a) as being unpatentable over Lee, in view of Hembree, in further view of Li, in further view of Wolf.

20. As to claim 8, Lee does not expressly disclose megasonic energy in the range of 800 kHz – 1200 kHz. However, Wolf teaches that conventional megasonics use higher frequency of 850 kHz (page 519, Figure 3). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to use megasonic energy in the range of 800 kHz – 1200 kHz. One who is skilled in the art would be motivated to use a conventional frequency, known to remove particulates.

Claim Rejections - 35 USC § 103

21. Claims 11 and 12 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Lee, in view of Hembree, in further view of Wolf.

22. As to claim 11, Lee does not expressly disclose the wet etch solution comprises an acid compatible with temperatures above approximately 70°C and etches stoichiometric silicon nitride and is selective to dielectric materials. Wolf further teaches that wet etching, a generally isotropic process, is widely used for producing semiconductor devices because it is low cost, reliable, and a high throughput process with excellent selectivity with respect to both masks and substrate materials (page 529). Wolf teaches that silicon nitride is etched in 85% phosphoric acid at 180°C, with silicon oxide as an etch mask (page 534). In other words, silicon nitride is conventionally etched with phosphoric acid with temperatures above approximately 70°C and is selective to silicon oxide. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to use a wet isotropic etch, because Wolf teaches that wet etching is widely used for producing semiconductor devices due to its low cost, reliable, and a high throughput process with excellent selectivity with respect to both masks and substrate materials. Moreover, it would have been obvious to one of ordinary skill in the art at the time the invention was made to use a wet etch solution comprising an acid compatible with temperatures above approximately 70°C and etches stoichiometric silicon nitride and is selective to dielectric materials. One who is skilled in the art would be motivated to use a conventional wet etching solution, such as phosphoric acid, known to accomplish the task of etching silicon nitride.

23. As to claim 12, Wolf discloses that the wet etch solution comprises approximately 84% by volume phosphoric acid in water (page 534).

Claim Rejections - 35 USC § 103

24. Claim 2 stands rejected under 35 U.S.C. 103(a) as being unpatentable over Patel et al. (U.S. Patent Appl. Pub. No. 2004/0240822), in view of Newn et al. (U.S. Patent No. 3,999,835).

25. As to claim 2, Patel discloses a method, comprising: etching a waveguide (54) to smooth a surface (66/68) of the waveguide (paragraph 0039; Figures 12-15).

26. Patel does not expressly disclose that the etch is isotropic; and that the waveguide comprises stoichiometric silicon nitride. However, Patel teaches that smoothing of the sidewalls (66/68) and surfaces of the waveguide (54) can be achieved by plasma etching (paragraph 0039). Moreover, the smoothing of waveguide (54) results in a reduction in optical scattering losses (paragraph 0039). Wolf teaches that plasma etching is isotropic (page 541). Newn teaches that stoichiometric silicon nitride is a material suitable for forming an optical waveguide (column 2, lines 11-23). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to etch isotropically, because Patel teaches that smoothing of the waveguide with a plasma (or isotropic etch) results in a reduction in optical scattering losses. Moreover, it would have been obvious to one of ordinary skill in the art at the time the invention was made to form the waveguide with stoichiometric silicon nitride,

because Newn teaches that silicon nitride is conventional material suitable for forming an optical waveguide.

Claim Rejections - 35 USC § 103

27. Claim 13 stands rejected under 35 U.S.C. 103(a) as being unpatentable over Patel, in view of Wolf, in further view of Li, in further view of Ilardi (U.S. Patent No. 5,466,389).

28. As to claim 13, Patel discloses a method, comprising: etching a waveguide (54) to smooth a surface (66/68) of the waveguide (paragraph 0039; Figures 12-15).

29. Patel does not expressly disclose that the etching is isotropic; and that etching the waveguide comprises submerging the waveguide in a wet etch solution. However, Patel teaches that smoothing of the sidewalls (66/68) and surfaces of the waveguide (54) can be achieved by plasma etching (paragraph 0039). Moreover, the smoothing of waveguide (54) results in a reduction in optical scattering losses (paragraph 0039). Wolf teaches that plasma etching is isotropic (page 541). Wolf further teaches that wet etching, a generally isotropic process, is widely used for producing semiconductor devices because it is low cost, reliable, and a high throughput process with excellent selectivity with respect to both masks and substrate materials (page 529). Wolf also teaches wet etching by submerging the sample in a wet etch solution (pages 529-530). Li teaches a method of etching silicon using an ammonia hydroxide wet etch solution (column 2, lines 25-34) which is selective to dielectric materials and organic photoresists (column 3, lines 50-54). Ilardi teaches the use of an ammonia hydroxide

solution having a pH of 8 to 10 with a non-metallic base (column 2, lines 29-34) directed at cleaning silicon wafers (column 1, lines 15-17). Moreover, Ilardi teaches, the alkaline composition reduces wafer surface roughness (column 2, lines 34-37). It should also be noted that there is overlap between Applicants' and Ilardi's pH ranges. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to use a wet isotropic etch and to submerge the waveguide in a wet etch solution, because Wolf teaches that wet etching is widely used for producing semiconductor devices due to it is low cost, reliable, and a high throughput process with excellent selectivity with respect to both masks and substrate materials. Moreover, it would have been obvious to one of ordinary skill in the art at the time the invention was made to an ammonia hydroxide wet etch solution, because Li teaches that an ammonia hydroxide solution is beneficial due to its selective to dielectric materials and organic photoresist. Lastly, it would have been obvious to one of ordinary skill in the art at the time the invention was made to use the wet etch solution having a pH in the approximate range of 10-13. One who is skilled in the art would be motivated to select a range similar to Ilardi, because Ilardi teaches that alkaline solutions reduce surface roughness.

30. As to claim 14, Ilardi discloses that the base is a non-metallic base (column 2, lines 29-37).

31. As to claim 15, Li discloses performing the isotropic etch at a temperature in the approximate range of 24°C-70°C (column 4, lines 57-59).

Claim Rejections - 35 USC § 103

32. Claims 16 and 21 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Lee.

33. As to claim 16, Lee does not expressly disclose etching the waveguide for a time sufficient to smooth the surface of the waveguide to maximize retention of a light signal within the waveguide. However, Lee teaches etching the waveguide to smooth the surface of the waveguide (column 4, lines 4-19). Furthermore, Lee teaches that reducing the optical losses through smoothing the surface of the waveguide (column 4, lines 4-10). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to etch the waveguide for a time sufficient to smooth the surface of the waveguide to maximize retention of a light signal within the waveguide. One who is skilled in the art would be motivated to reduce the optical losses through smoothing the surface of the waveguide.

34. As to claim 21, Lee does not expressly disclose that the light intensity loss of a substantially smoothed waveguide is approximately 6 dB/cm. Lee discloses a light intensity loss of a substantially smoothed waveguide of approximately 0.8 dB/cm (column 3, lines 45-48). Moreover, Lee teaches reducing the optical losses through smoothing the surface of the waveguide (column 4, lines 4-10). In other words, surface smoothness of the waveguide is correlated to with optical losses. If an optical loss of 6 dB/cm is desired, one who is skilled in the art would reduce the number of smoothing steps. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to smooth the waveguide with a light intensity loss of

approximately 6 dB/cm. One who is skilled in the art would be motivated to reduce the number of process step for fabricating the optical device.

Claim Rejections - 35 USC § 103

35. Claims 17-18 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Patel, in view of Wolf, in further view of Li.

36. As to claim 17, Patel discloses a method comprising: forming an amorphous silicon layer (50) on a first dielectric layer (3) (paragraphs 0038, 0032); etching the amorphous silicon layer (50) with a dry plasma etch to form at least one waveguide (54) (paragraphs 0038); and forming a second dielectric layer above the at least one waveguide (paragraph 0005).

37. Patel does not expressly disclose an anisotropic dry plasma etch; and submerging the at least one waveguide in an ammonia hydroxide isotropic wet etch solution to which sonic energy is being applied at approximately room temperature for a time sufficient to smooth the a surface of the waveguide. Wolf teaches that anisotropic etching results is greater dimensional control of etched features (page 551). Patel teaches that smoothing of the sidewalls (66/68) and surfaces of the waveguide (54) can be achieved by plasma etching (paragraph 0039). Moreover, the smoothing of waveguide (54) results in a reduction in optical scattering losses (paragraph 0039). Wolf teaches that plasma etching is isotropic (page 541). Wolf further teaches that wet etching, a generally isotropic process, is widely used for producing semiconductor devices because it is low cost, reliable, and a high throughput process with excellent

selectivity with respect to both masks and substrate materials (page 529). Li teaches a method of etching silicon using an ammonia hydroxide wet etch solution to which sonic energy is being applied at approximately room temperature (column 2, lines 25-34). Li further teaches that sonic energy removes silicon at a faster rate (column 2, lines 33-35) and that such an ammonia hydroxide solution is beneficial because it is selective to organic photoresist (column 2, lines 6-10), unlike many other commercial silicon etchants (column 1, lines 53-65). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to use an anisotropic dry plasma etch. One who is skilled in the art would be motivated to achieve greater dimensional control over etched features. Furthermore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to use a wet isotropic etch, because Wolf teaches that wet etching is widely used for producing semiconductor devices due to its low cost, reliable, and a high throughput process with excellent selectivity with respect to both masks and substrate materials. Moreover, it would have been obvious to one of ordinary skill in the art at the time the invention was made to use an ammonia hydroxide isotropic wet etch solution to which sonic energy is being applied, because Li teaches that an ammonia hydroxide solution is beneficial due to its selectivity to organic photoresist and that sonic energy removes silicon at a faster rate. Lastly, it would have been obvious to one of ordinary skill in the art at the time the invention was made to etch for a time sufficient to smooth the surface of the waveguide, because Patel teaches that smoothing of waveguide results in a reduction in optical scattering losses.

38. As to claim 18, Li discloses that the isotropic etch for amorphous silicon is a wet etch solution comprising ammonium hydroxide in the approximate range of 2%-10% by volume in water (column 2, lines 25-34).

Claim Rejections - 35 USC § 103

39. Claim 19 stands rejected under 35 U.S.C. 103(a) as being unpatentable over Patel, in view of Wolf, in further view of Li, in further view of Liu et al. (U.S. Patent No. 4,817,652).

40. As to claim 19, Patel does not expressly disclose that the sonic energy impacts the waveguide with a power in the approximate range of 0.5 W/cm^2-10.0 W/cm^2. Li teaches that sonic energy removes silicon at a faster rate (column 2, lines 33-35) because sound waves travel through the etch solution and facilitate the removal of particles (column 6, lines 12-18). Moreover, Liu teaches that for the removal of microscopic particulate matter from a semiconductor wafer (column 1, lines 16-21), a sonic power density of 5 to 10 W/cm^2 is conventional (column 1, lines 50-55). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to use a power in the approximate range of 0.5 W/cm^2-10.0 W/cm^2. One who is skilled in the art would be motivated to use a power density known to accomplish the task of removing particulate matter from an etched surface.

Response to Arguments

41. Applicants' arguments (Applicants' Remarks, page 6), regarding the rejection of claims 1 and 20 under 35 U.S.C. 102(b) as anticipated by Lee have been fully considered but they are not persuasive.

42. Applicants argue that "Lee fails to disclose that the etching of the layer (102) to the form the waveguide core (108) is isotropic" (page 6, first paragraph). In response to Applicants' argument that the references fail to show certain features of applicant's invention, it is noted that the features upon which Applicant relies (i.e., etching of the layer to the form the waveguide core is isotropic) are not recited in the rejected claims. Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993).

43. Furthermore, Applicants broadly claim "etching a waveguide isotropically to smooth a surface of a waveguide." Lee discloses "subjecting the...waveguide core to a wet chemical can also reduce the roughness and thus reduce losses... [b]oth anistropic and *isotropic etchants* can be used" (emphasis added) (column 4, lines 9-11). Lee further discloses that "[w]hen an *isotropic etchant is used*, the etching process reduces the roughness on the core surfaces to minimize the energy of rough surfaces" (emphasis added) (column 4, lines 17-19). Therefore, Applicants' claims 1 and 20 are anticipated by the Lee reference.

44. Applicants' arguments (Applicants' Remarks, page 6), regarding the rejection of claims 17 and 18 under 35 U.S.C. 103(a) as unpatentable over Patel, in view of Wolf, in further view of Li, have been fully considered, but they are not persuasive.

45. First, Applicants argue that the Patel and Wolf references does not teach or suggest "etching the amorphous silicon layer with an anisotropic dry plasma etch to form at least one waveguide" (page 6, second paragraph). However, Patel discloses etching an amorphous ("It is to be understood that various forms of silicon may be utilized to form the waveguiding structures... include...*amorphous silicon*" (emphasis added), paragraph 0032) or polycrystalline silicon layer (50) with dry plasma etch to form at least one waveguide (54) (paragraph 0038). Wolf teaches that *anisotropic dry etching* is advantageous because of greater dimensional control. Thus, there is proper motivation to combine the Patel and Wolf references to suggest the claim limitation of "etching the amorphous silicon layer with an anisotropic dry plasma etch to form at least one waveguide." Applicants have not provided any evidence (i.e., unexpected results) to rebut the *prima facie* case of obviousness.

46. Second, Applicants argue that the Patel, Li, and Wolf references to not teach or suggest "submerging the at least one waveguide in an ammonia hydroxide isotropic wet etch solution" (page 6, second paragraph). However, Patel teaches the advantages of smoothing the sidewalls (66/68) to reduce the optical scattering losses by plasma etching, which is an isotropic process (paragraph 0039). Thus, motivation exists to smooth the sidewalls (66/68) or waveguide (54) using an isotropic etch, to produce smooth corners ("The plasma etching process may use any suitable species...where it

is known that some species are *more isotropic than others*...to obtain the desired etch profile (in this case, a rounded sidewall)" (emphasis added), paragraph 0039). Wolf teaches that wet etching is a generally isotropic process and has the advantages of wide use in producing semiconductor devices because it is low cost, reliable, and a high throughput process with excellent selectivity with respect to both masks and substrate materials (page 529). Li teaches the benefits of etching silicon using an ammonia hydroxide wet etch solution and that sonic energy removes silicon at a faster rate (column 2, lines 33-35) and that such an ammonia hydroxide solution is beneficial because it is selective to organic photoresist (column 2, lines 6-10). Thus, the combination of the Patel, Wolf, and Li references teach or suggest the claim limitation of "submerging the at least one waveguide in an ammonia hydroxide isotropic wet etch solution". Applicants have not provided any evidence (i.e., unexpected results) to rebut the *prima facie* case of obviousness.

Conclusion

47. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any

extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Eric B. Chen whose telephone number is (571) 272-2947. The examiner can normally be reached on Monday through Friday, 8AM to 4:30PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nadine G. Norton can be reached on (571) 272-1465. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

EBC
EBC
Feb. 16, 2006

EXAMINER